A Grand Unification Theory [GUT] using Time to unify gravity, the strong nuclear force, the weak nuclear force, and the electromagnetic force.

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Abstract:

Grand unification of the fundamental interactions [strong and weak nuclear, gravitational, and electromagnetic] forces of nature can be achieved using time as a common term created by changes in the reconfigurations of unstable or decaying systems from subatomic to cosmic scales.

Introduction:

The 'time' that is derived or computed our brains T-computer [figure 1] or its equivalent measurement instrumentation using information from signals created by reconfigurations of material systems can be used to link the various forces together in a unified picture in which the mathematics given in this paper show that they are also physically linked.

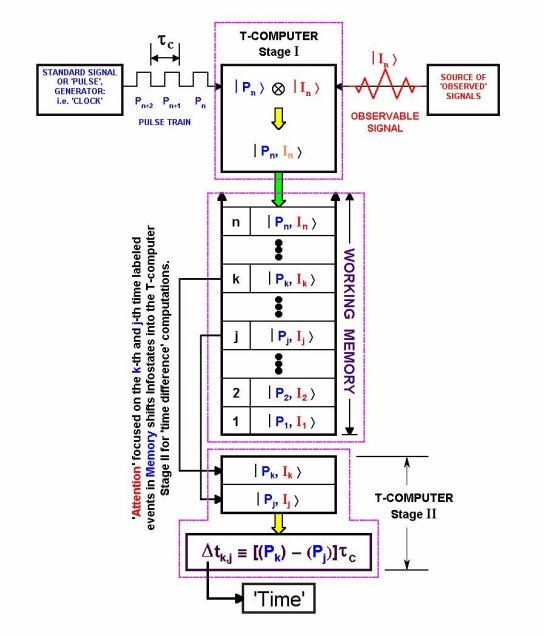

Figure 1: The brains T-computer

$$\tau_{S_{FC}} \equiv \frac{\hbar}{\Gamma_{FC}} = \frac{\hbar}{|\langle 1, E_0 \mid H_{E^* \rightarrow E_0} \mid 0, E^* \rangle|^2} = \frac{\hbar}{\mathbf{I}_R}$$

Equation 1 [above] shows how time is computed from the energy of reconfiguration from the excited state **E*** to the lower energy state $\mathbf{E_0}$. This is change of state for a **Feynman Clock** [FC]. Planck's constant converts this to unit of time which represents the 'decay' time or lifetime of the process or reconfiguration of the system ***S.***

Note that the denominator in equation 1 above, $\mathbf{I_R} = \mathbf{\Gamma}_{FC}$ usually referred to as the 'decay rate' is the term in equation 2 below.

$$\left|\langle \Psi_{(E_0)} \mid H_{E^* \to E_0} \mid \Psi_{(E^*)} \rangle\right|^2$$

Equation 2 [above]: this term encodes the reconfiguration process information for any system ***S*** with units of energy.

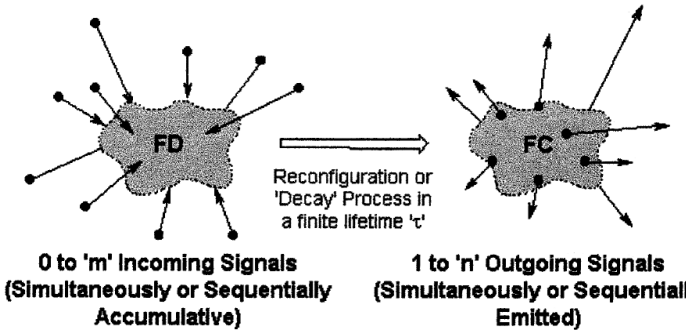

Figure 2 [above]: the **Feynman Clock System [*S*]** going through a reconfiguration process from its ***excited*** or **unstable** state *detector* mode [*aka* **Feynman Detector** or **FD**] via a decay to the more stable or lower energy **Feynman Clock [FC]** mode through the absorption of incoming signals and emission of outgoing signals that carry information used by the T-computer to create a 'time' for the process relative to a standard clock. The Feynman Clock is the fundamental building block used to create causal networks that map changes in complex or connected systems of particles or higher order systems of particles.

The decay of the excited state is irreversible in the sense that once the unstable state is created it must decay. The bottom term in the above equation is the 'intrinsic energy of reconfiguration' for an unstable quantum system. The system in a ground state will not spontaneously become excited without a signal from it's environment. The 'excited' state may be recreated by another incoming photon of the same energy, but this requires information to be put into the FC from it's environment. This is not 'time reversal' but a 'reconfiguration' process.

$$\tau_U = \alpha \tau_{strong} = \frac{\hbar}{\Gamma_{strong}}$$

Equation 3 [above]: Lifetime of reconfiguration driven by the strong nuclear force

$$\tau_U = \beta \tau_{weak} = \frac{\hbar}{\Gamma_{weak}}$$

Equation 4 [above]: Lifetime of reconfiguration driven by the weak nuclear force

$$\tau_U = \epsilon \tau_{grav} = \frac{\hbar}{\Gamma_{grav}}$$

Equation 5 [above]: Lifetime of reconfiguration driven by the gravitational force

$$\tau_U = \delta\tau_{em} = \frac{\hbar}{\Gamma_{em}}$$

Equation 6 [above]: Lifetime of reconfiguration driven by the electromagnetic force

Note: this method can be applied to the unified **electroweak** combination leading to experimental design and testing

$$\tau_U = \alpha\tau_{strong} = \beta\tau_{weak} = \delta\tau_{em} = \epsilon\tau_{grav}$$

► **Equation 7 [above]**: **Grand Unification of the Forces and Fundamental Interactions** using reconfiguration **lifetimes,** where τ_U is the **grand unification time** normalized by scalars **α, β, δ,** and **ε.** We can then substitute **equation 1** for each of the systems in **equation 7** to see how the forces are unified. Working backwards from this to more specific equations for each of the systems we have a generalized Grand Unification Theory where all the forces are unified by the common term; **time** [*actually lifetime*].

Conclusions: A Grand Unification Theory using Time to connect the fundamental interactions and forces of nature by Physicist and Artist Scott Matheson Hitchcock is proven. Unification of the Strong, Weak, Electromagnetic, and Gravitational forces is done by showing that reconfiguration processes of any system driven to change states by these forces creates information that is used to construct a scaled life-time for each of the processes. The time for the reconfigurations [change of state] is common to all forces providing that is a dimensionless scaler that equates them, where the time information produced is a function of the energy of reconfiguration and it subsequent generation of signals carrying vital information to an observer with a T-computer [see the following link **T-computers and the Origins of Time in the Brain**] or instrumental equivalent. See this paper: 'Feynman Clocks, Causal Networks, and the Origin of Hierarchical Arrows of Time in Complex Systems from the Big Bang to the Brain' Presented: Wednesday, June 21, 2000: An Invited Talk Given at The Institute For High Energy Physics [IHEP], Protvino, Russia. SMH3 – This paper is the first to present the Grand Unification Theory using Time to link the fundamental interactions of Nature [Strong, Weak, Electromagnetic, and Gravitational].

See **What Time Is and What Time Is Not**

Bibliography:

See the following link for Scott Matheson Hitchcock's various papers that support this:

https://archive.org/details/@nonessentialtime_gmail_com

1. Feynman Clocks, Causal Networks, and the Origin of Hierarchical Arrows of Time in Complex Systems from the Big Bang to the BrainPresented: Wednesday, June 21, 2000: An Invited Talk Given at The Institute For High Energy Physics [IHEP], Protvino, Russia. SMH3 – This paper is the first to present the Grand Unification Theory using **Time** to link the fundamental interactions of Nature [Strong, Weak, Electromagnetic, and Gravitational]. https://archive.org/details/smh-3_20210511/mode/2up